FIGURE 1

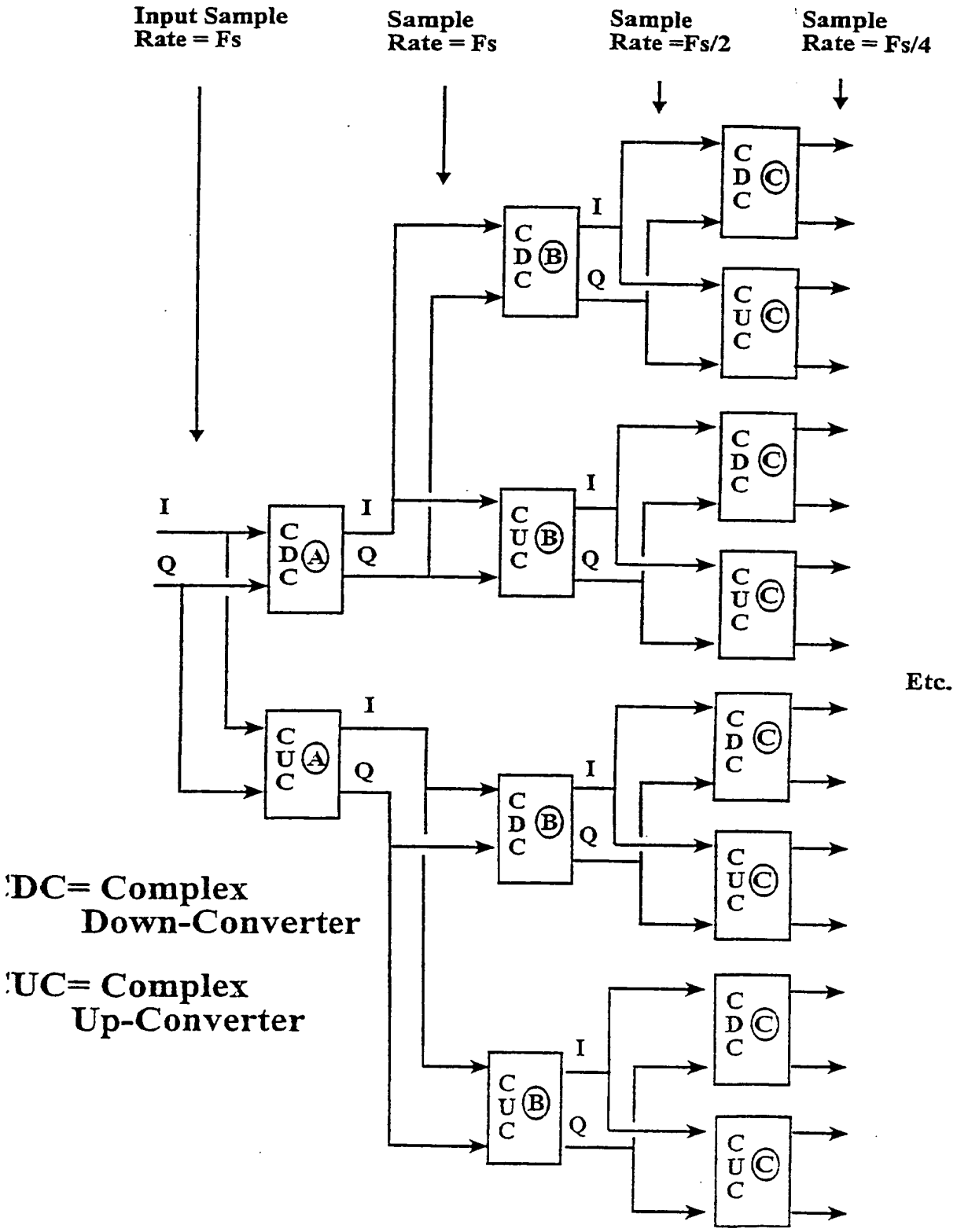

Input Sample Rate = Fs
Sample Rate = Fs
Sample Rate =Fs/2
Sample Rate = Fs/4
I
Q
CDC A
CUC A
CDC B
CUC B
CDC C
CUC C
Etc.
CDC= Complex Down-Converter
CUC= Complex Up-Converter

FIGURE 2

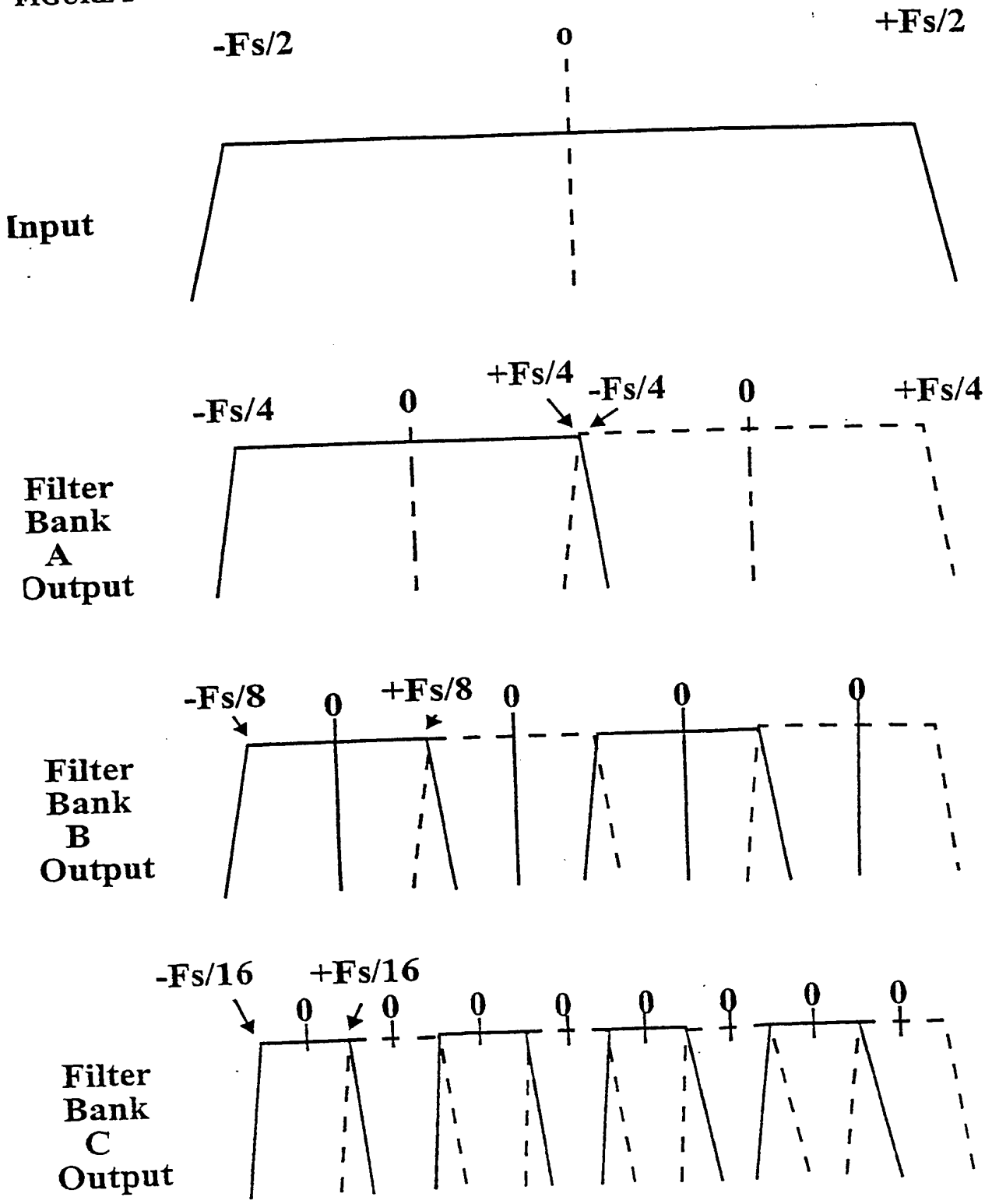
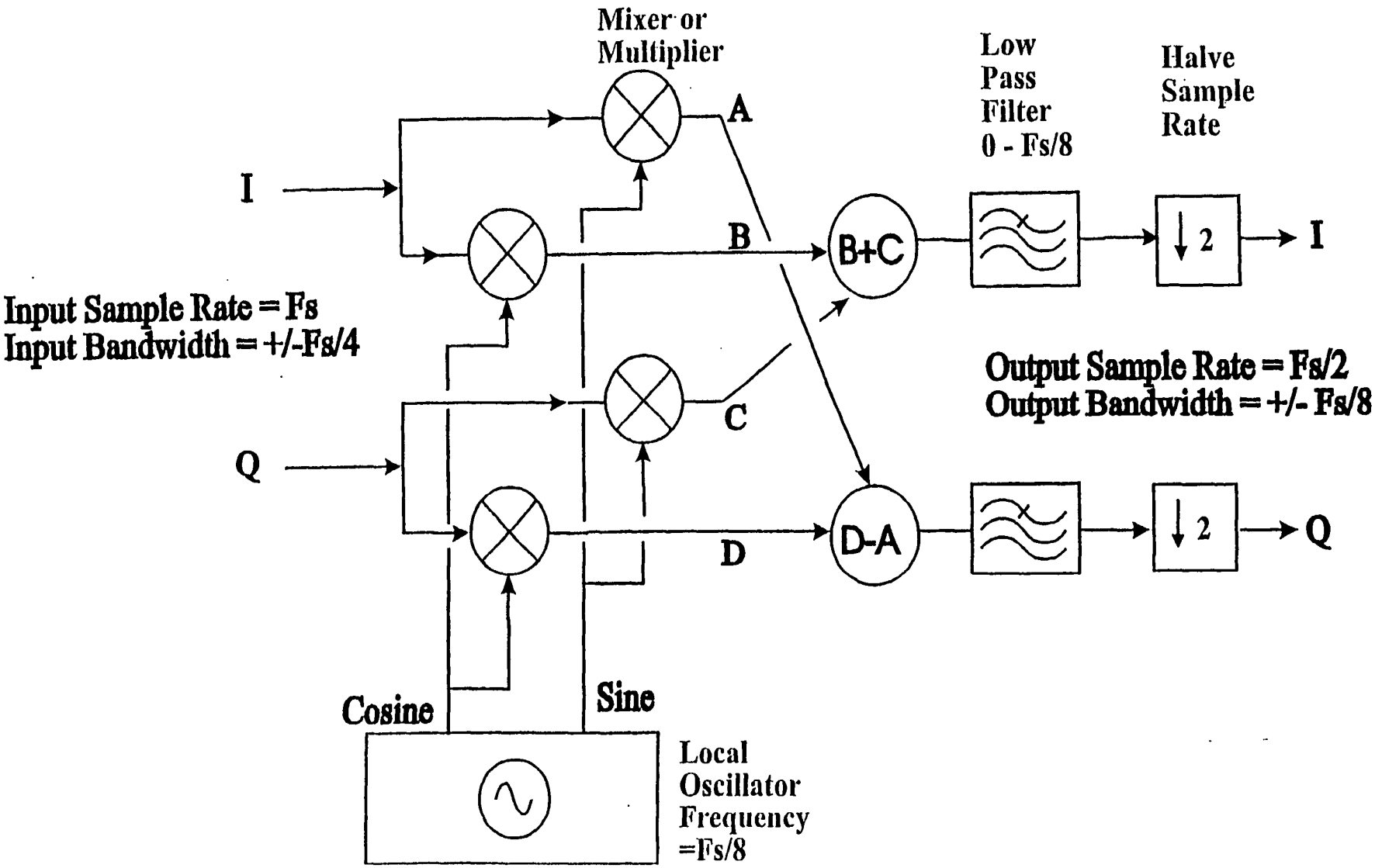

-Fs/2
0
+Fs/2
Input
+Fs/4
-Fs/4
-Fs/4
0
0
+Fs/4
Filter Bank A Output
-Fs/8
0
+Fs/8
0
0
0
Filter Bank B Output
-Fs/16
+Fs/16
0
0
0
0
0
0
0
0
Filter Bank C Output

FIGURE 3



3/25

10/520160

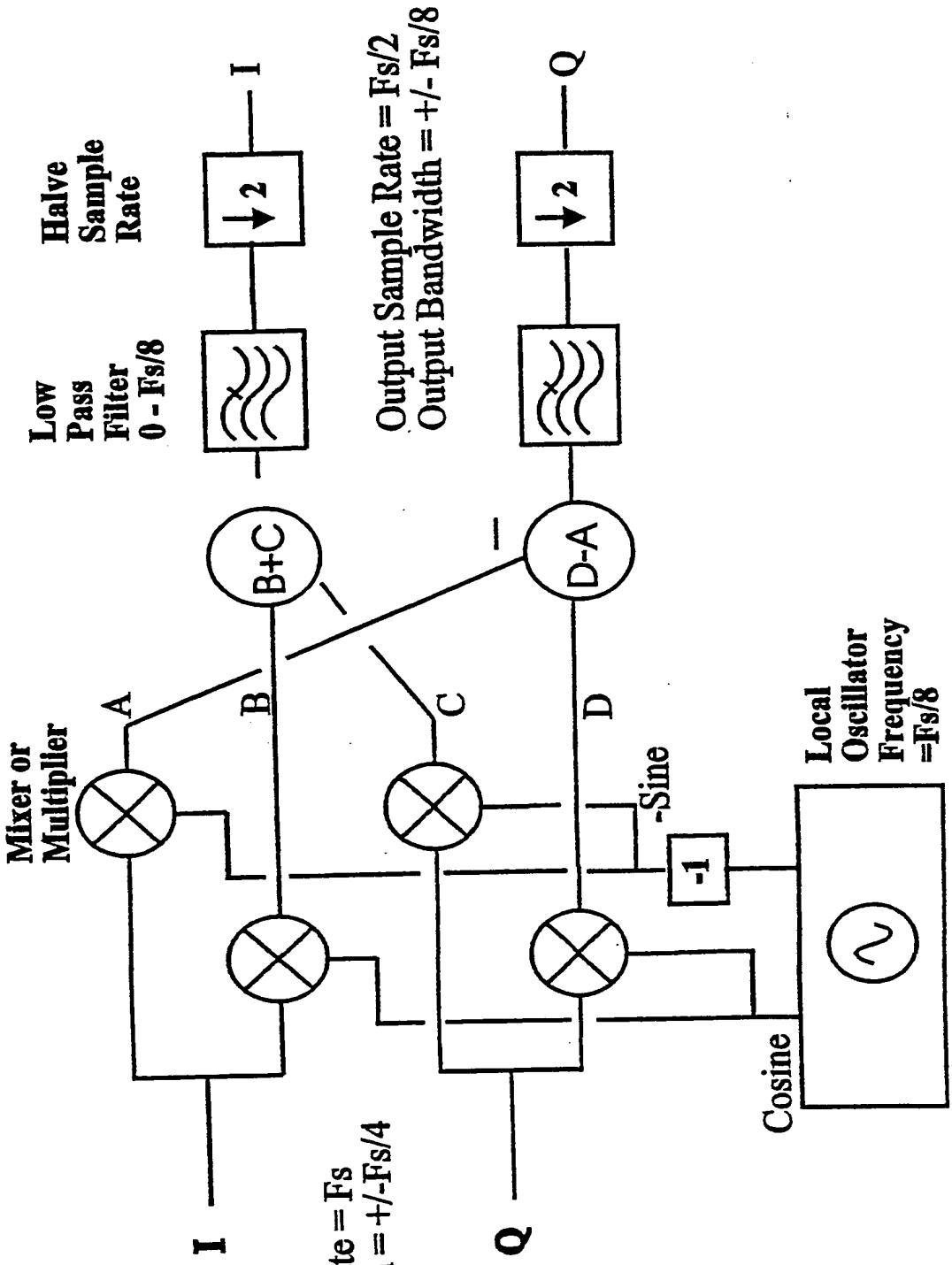
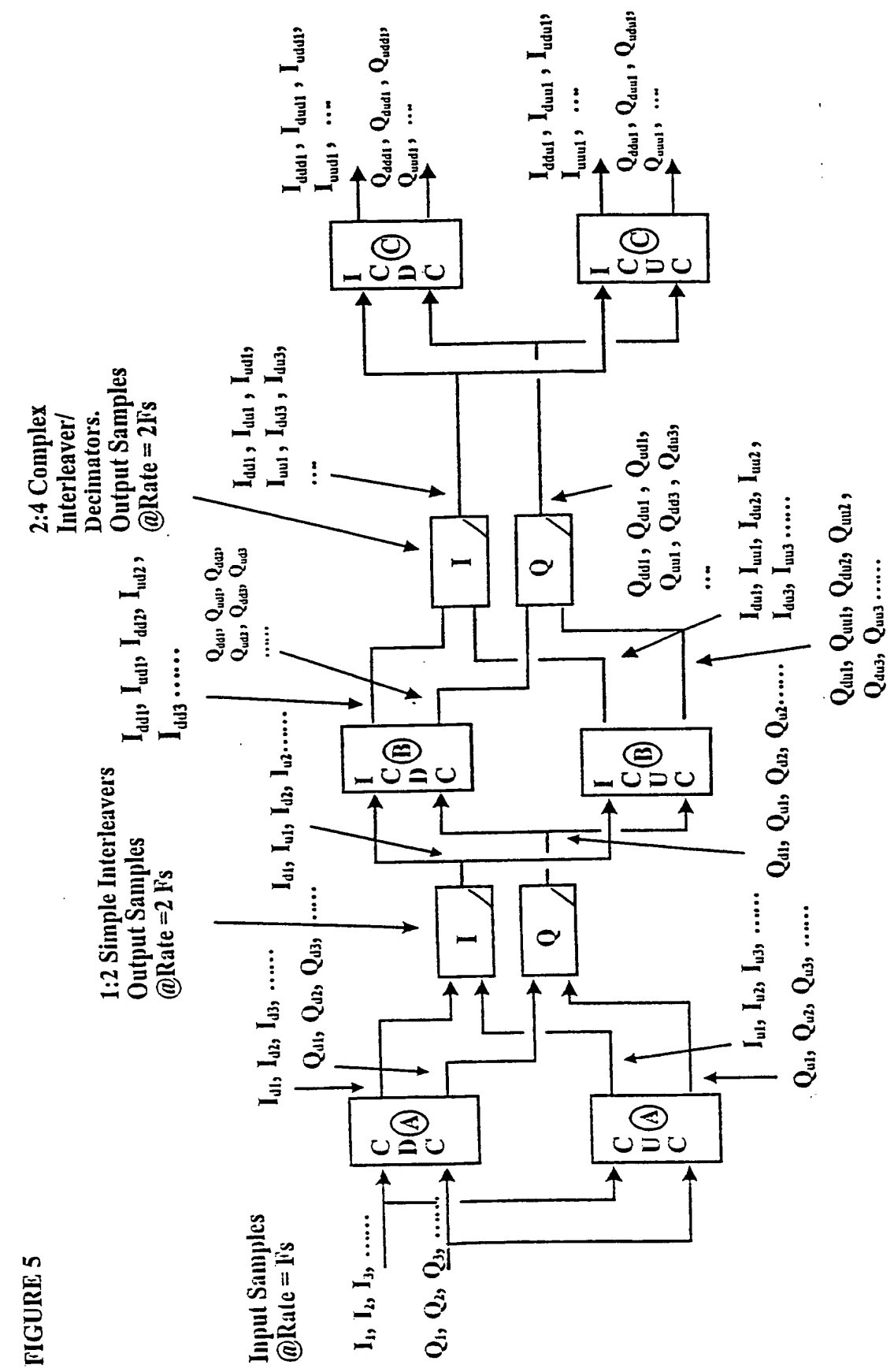

Input Sample Rate = Fs
Input Bandwidth = +/-Fs/4
I
Q
Mixer or Multiplier
A
B
C
D
B+C
D-A
-
-Sine
-1
Cosine
Local Oscillator Frequency =Fs/8
Low Pass Filter 0 - Fs/8
Halve Sample Rate
2
2
Output Sample Rate = Fs/2
Output Bandwidth = +/- Fs/8
I
Q

FIGURE 4

FIGURE 5


Input Samples
@Rate = Fs
I1, I2, I3, ...
Q1, Q2, Q3, ...
CDAC
CUAC
1:2 Simple Interleavers
Output Samples
@Rate =2 Fs
Id1, Id2, Id3, ...
Qd1, Qd2, Qd3, ...
Iu1, Iu2, Iu3, ...
Qu1, Qu2, Qu3, ...
I
Q
2:4 Complex
Interleaver/
Decimators.
Output Samples
@Rate = 2Fs
CDBC
CUBC
Idd1, Idu1, Iud1, Iuu1, Idd2, Idu2, Iud2, Iuu2, ...
Qdd1, Qdu1, Qud1, Quu1, Qdd2, Qdu2, Qud2, Quu2, ...
Idd3, Idu3, Iud3, Iuu3, ...
Qdd3, Qdu3, Qud3, Quu3, ...
CDCC
CUCC
Iddd1, Idud1, Iudd1, Iuud1, ...
Qddd1, Qdud1, Qudd1, Quud1, ...
Iddu1, Idud1, Iudu1, Iuud1, ...
Qddu1, Qdud1, Qudu1, Quud1, ...

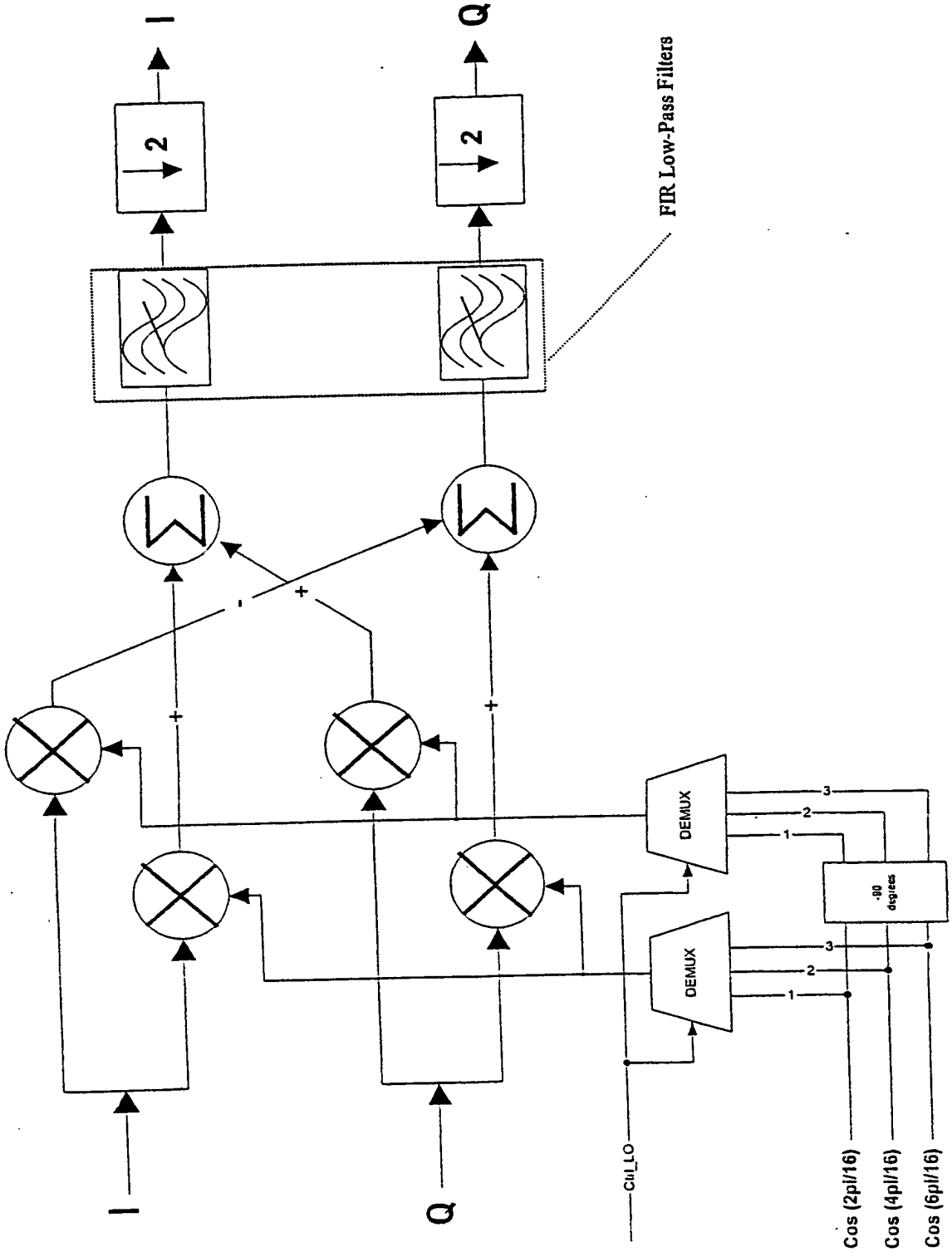

I
Q
2
2
FIR Low-Pass Filters
DEMUX
DEMUX
-90 degrees
3
2
1
3
2
1
I
Q
Cw_LO
Cos (2pi/16)
Cos (4pi/16)
Cos (6pi/16)

FIGURE 6A

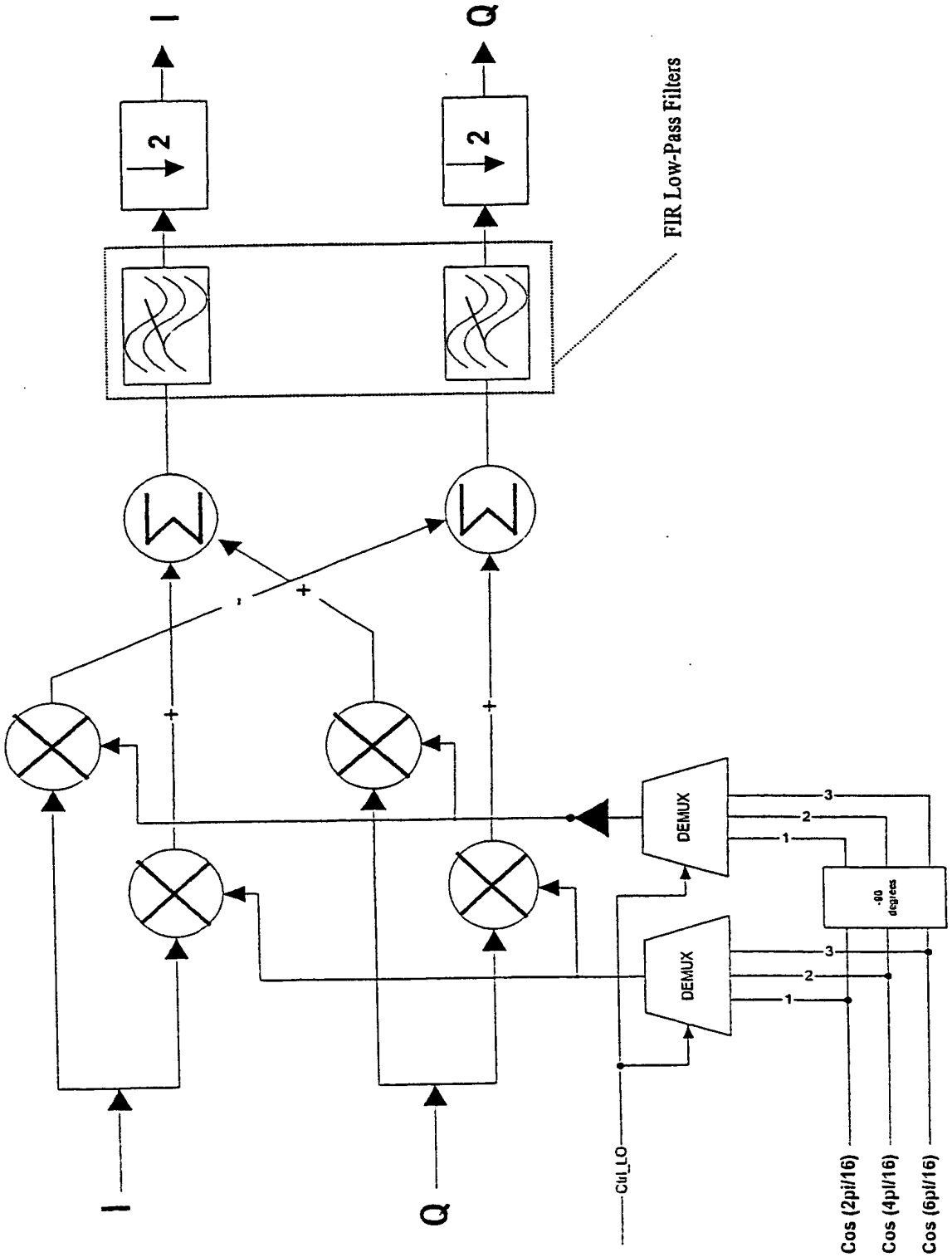

I
Q
2
2
FIR Low-Pass Filters
DEMUX
DEMUX
3
2
1
3
2
1
-90 degrees
I
Q
Cui_LO
Cos (2pi/16)
Cos (4pi/16)
Cos (6pi/16)

FIGURE 6B

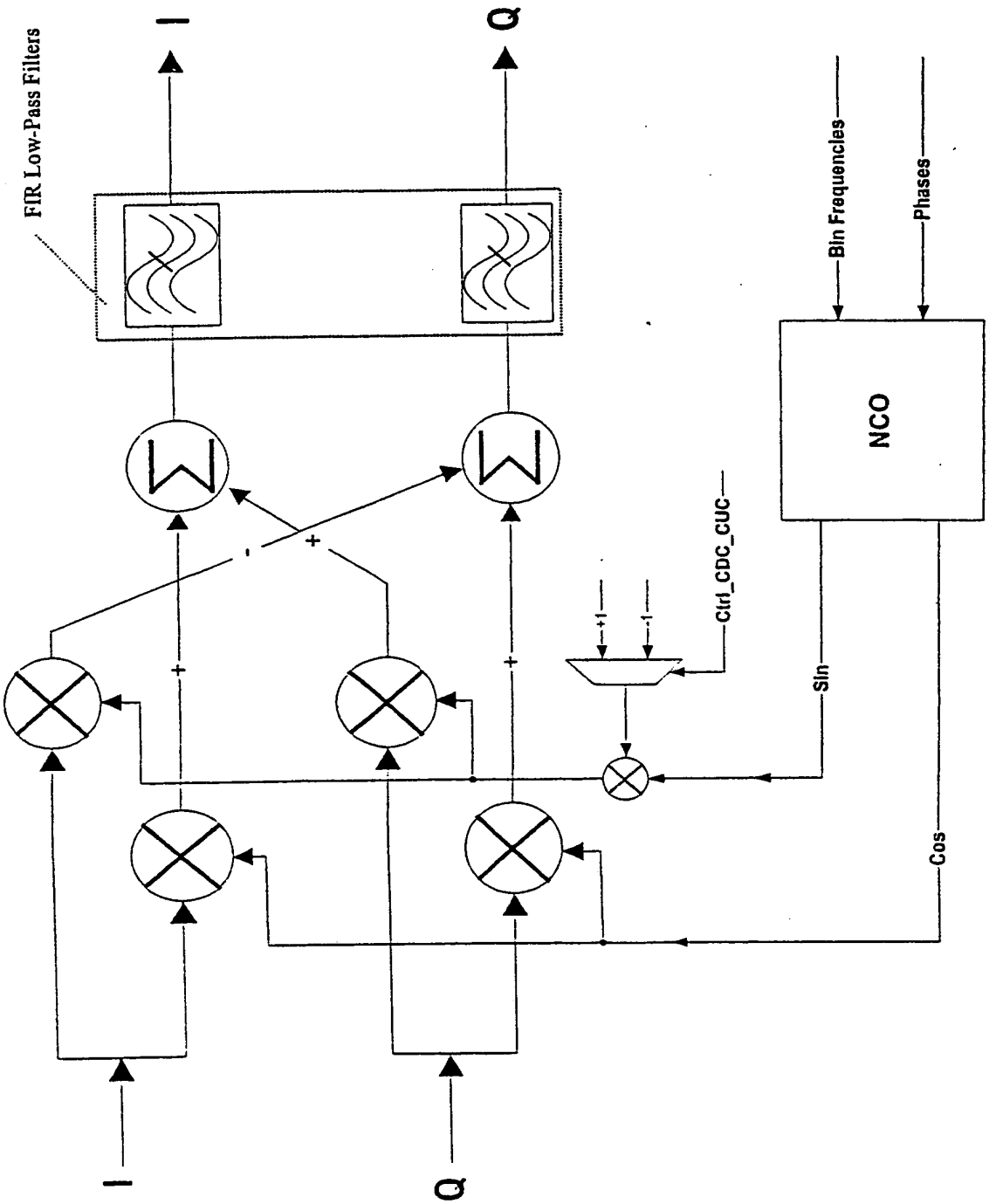

I
Q
FIR Low-Pass Filters
Bin Frequencies
Phases
NCO
Ctrl_CDC_CUC
+1
-1
Sin
Cos
I
Q

FIGURE 7

FIGURE 8

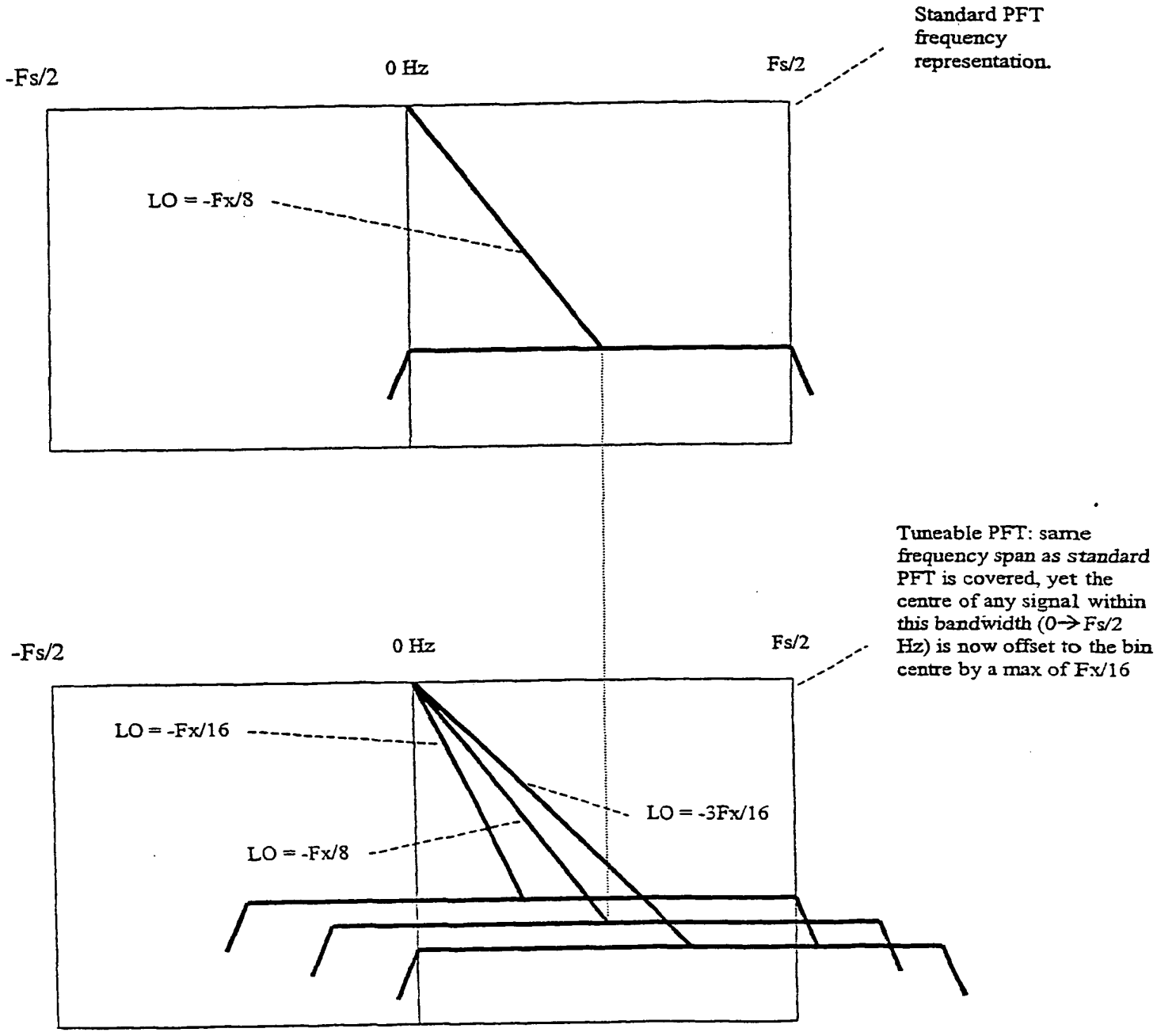
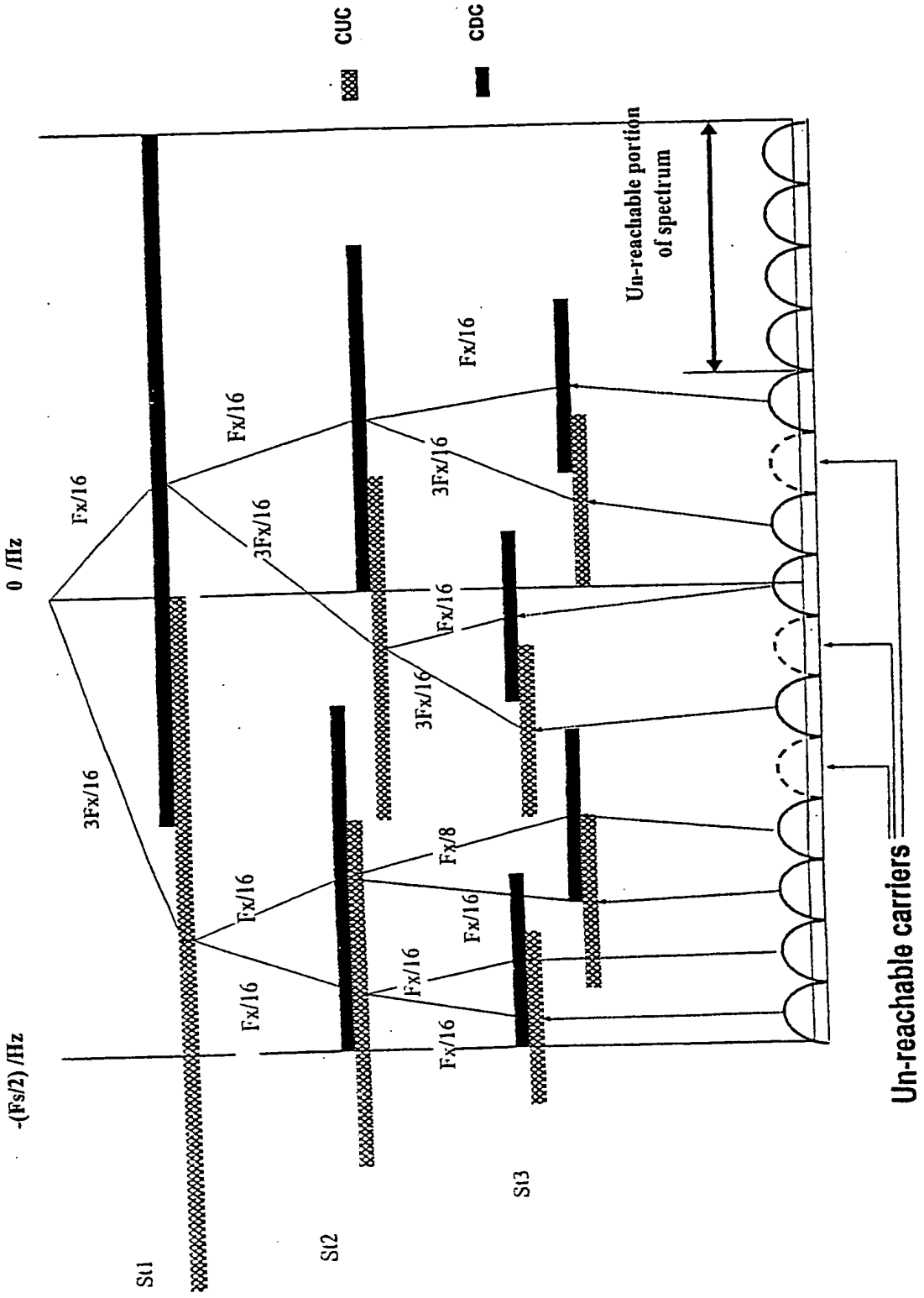

Standard PFT frequency representation.
-Fs/2
0 Hz
Fs/2
LO = -Fx/8
Tuneable PFT: same frequency span as standard PFT is covered, yet the centre of any signal within this bandwidth (0→Fs/2 Hz) is now offset to the bin centre by a max of Fx/16
-Fs/2
0 Hz
Fs/2
LO = -Fx/16
LO = -3Fx/16
LO = -Fx/8

FIGURE 9


(Fs/2) /Hz
0 /Hz
-(Fs/2) /Hz
CUC
CDC
Un-reachable portion of spectrum
Un-reachable carriers
St1
St2
St3
Fx/16
3Fx/16
Fx/8

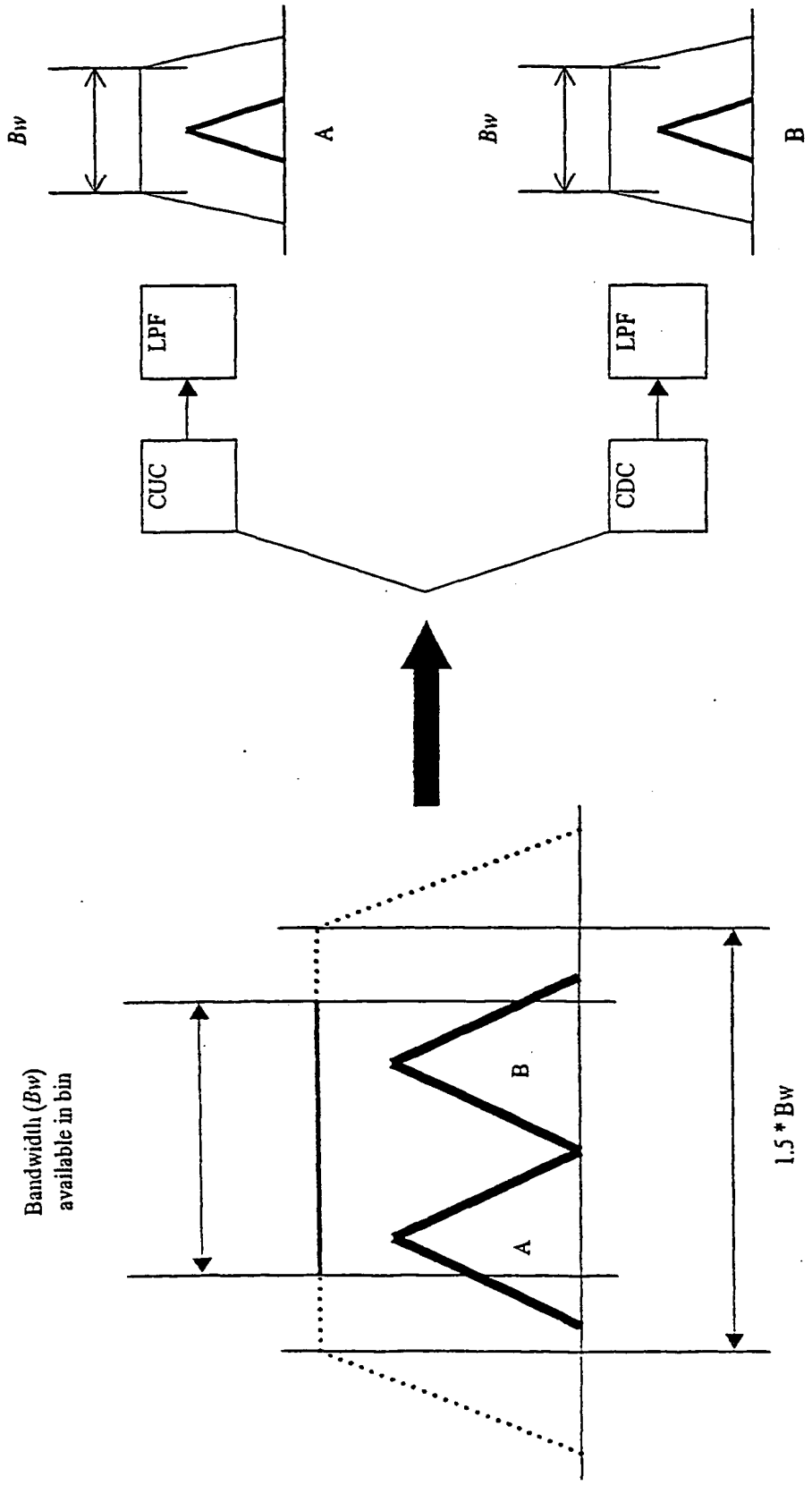
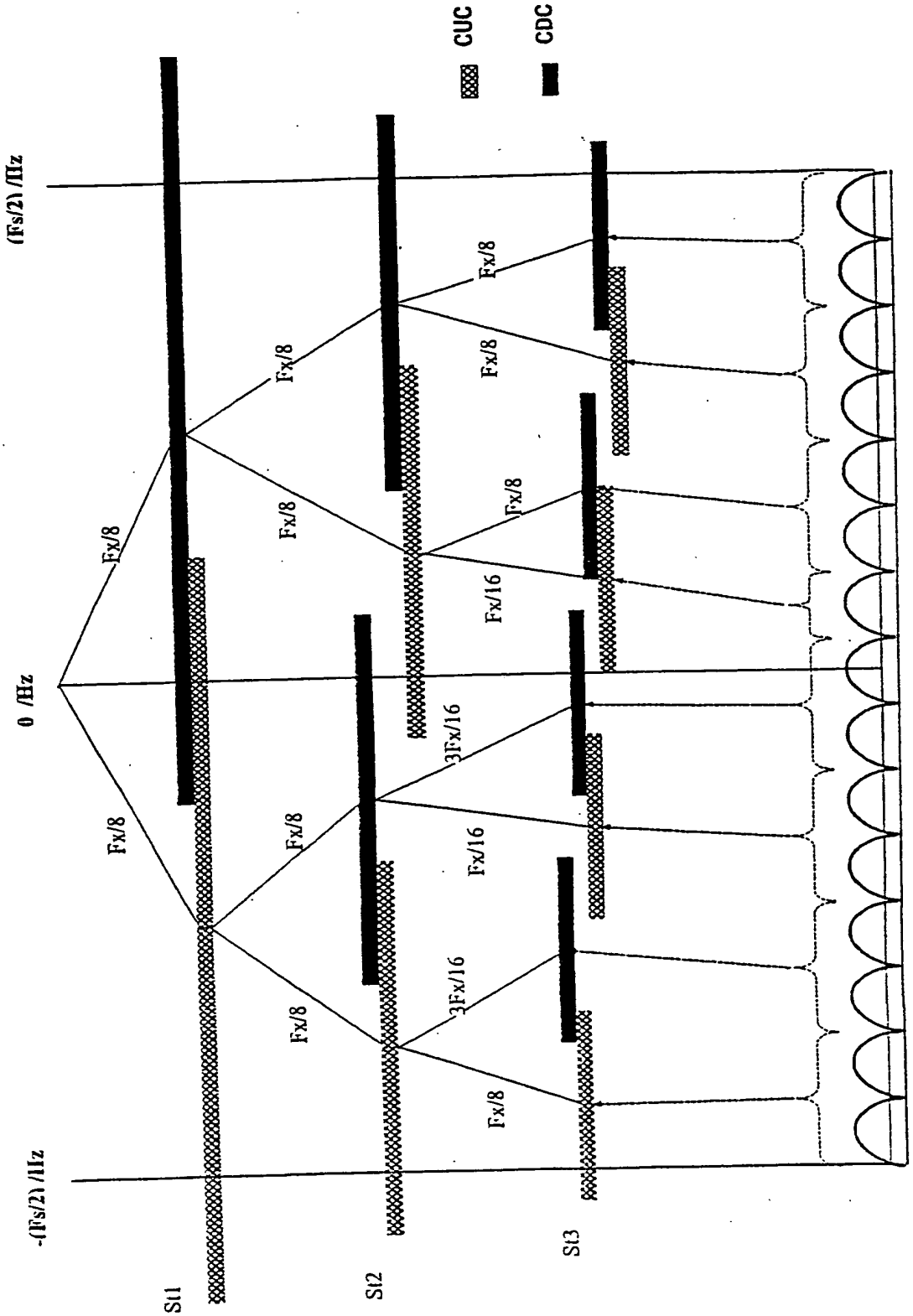


FIGURE 10

FIGURE 11



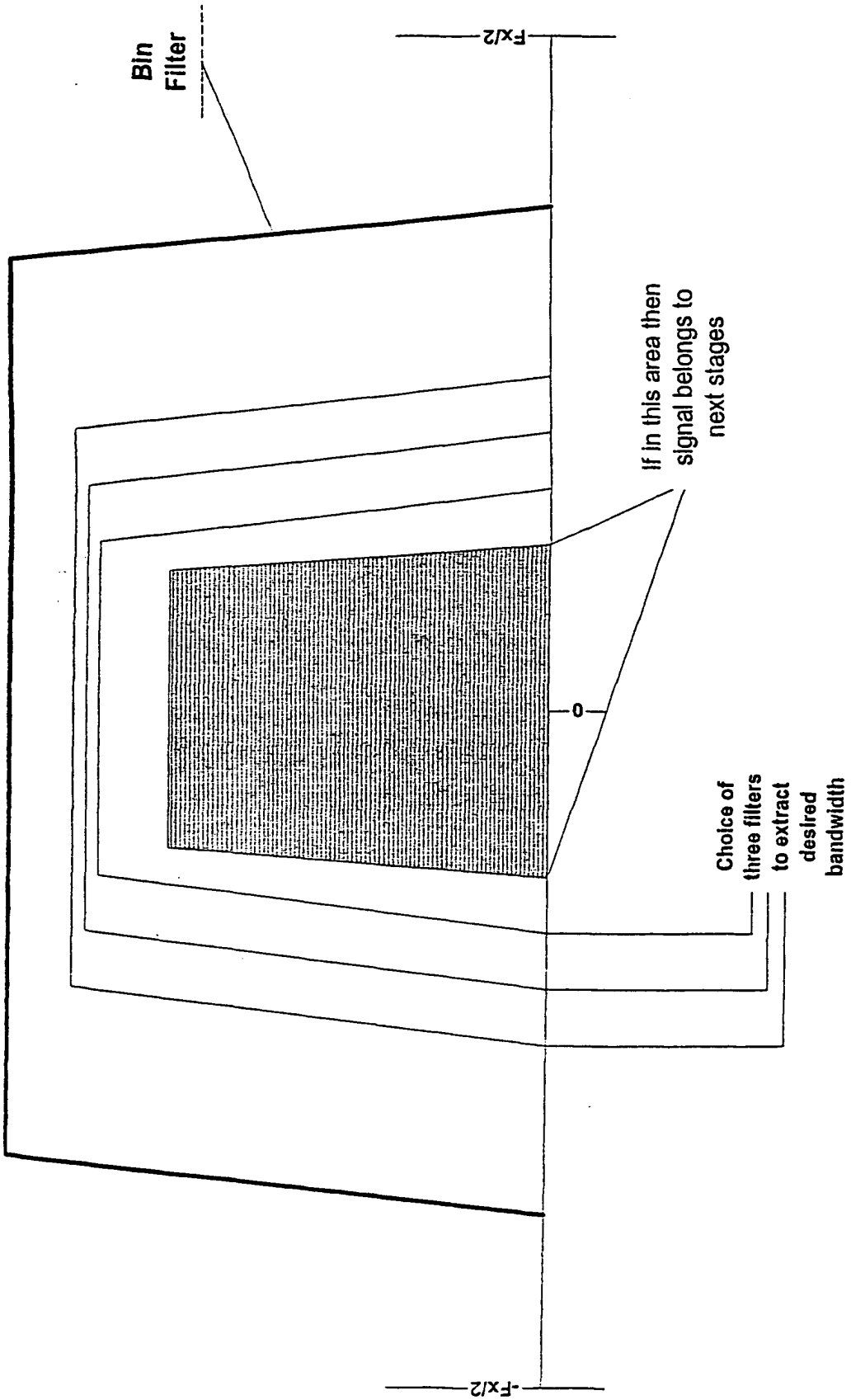

Bin Filter
Fx/2
If in this area then signal belongs to next stages
0
Choice of three filters to extract desired bandwidth
-Fx/2

FIGURE 12

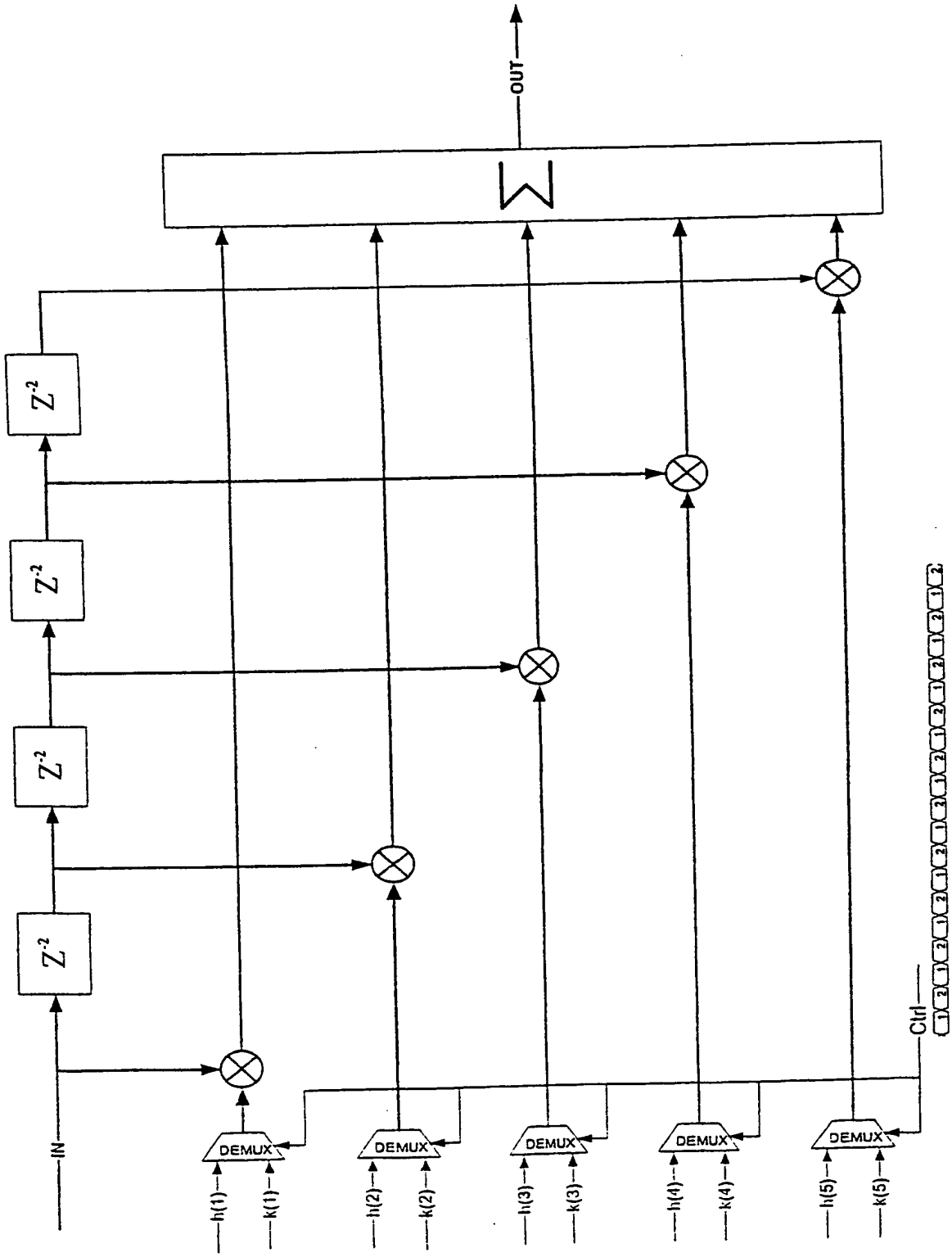

OUT
Z-2
Z-2
Z-2
Z-2
IN
DEMUX
DEMUX
DEMUX
DEMUX
DEMUX
h(1)
k(1)
h(2)
k(2)
h(3)
k(3)
h(4)
k(4)
h(5)
k(5)
Ctrl

FIGURE 13

FIGURE 14

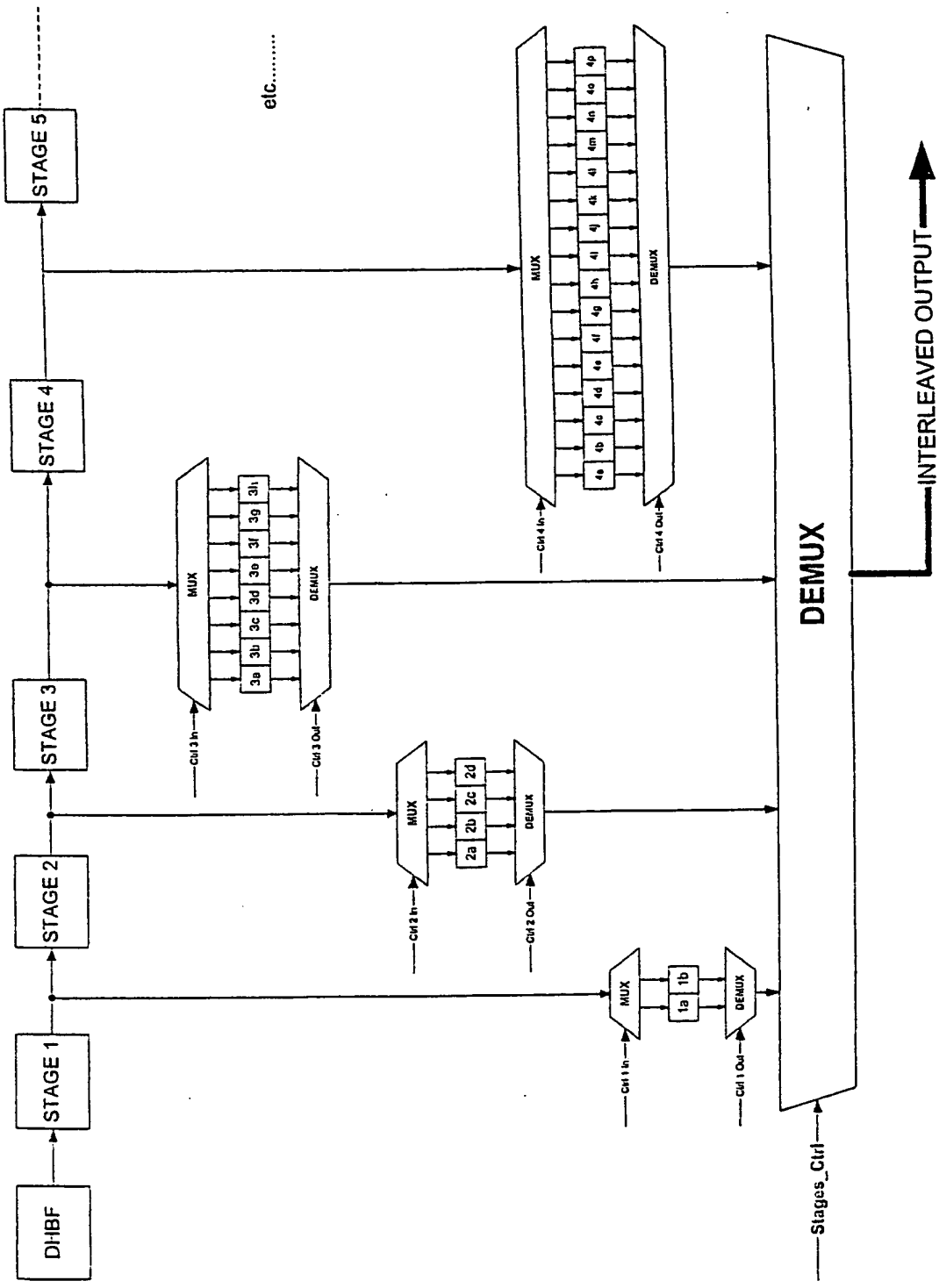
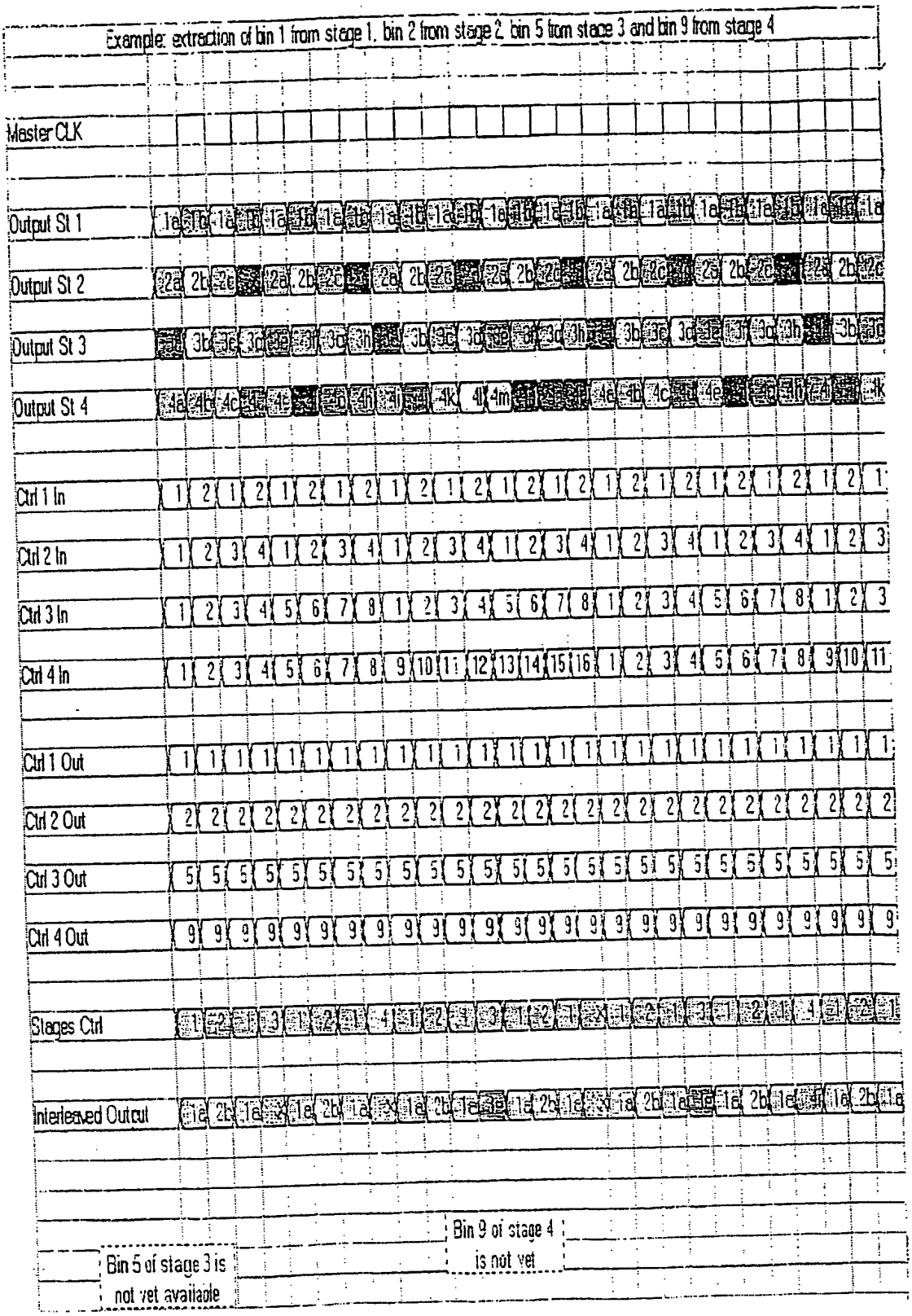

DHBF
STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5
etc.....
MUX
DEMUX
Ctrl 1 In
Ctrl 1 Out
Ctrl 2 In
Ctrl 2 Out
Ctrl 3 In
Ctrl 3 Out
Ctrl 4 In
Ctrl 4 Out
Stages_Ctrl
INTERLEAVED OUTPUT

FIGURE 15



Part 1 | Part 2

Fig.16

Fig.16 - Part 1

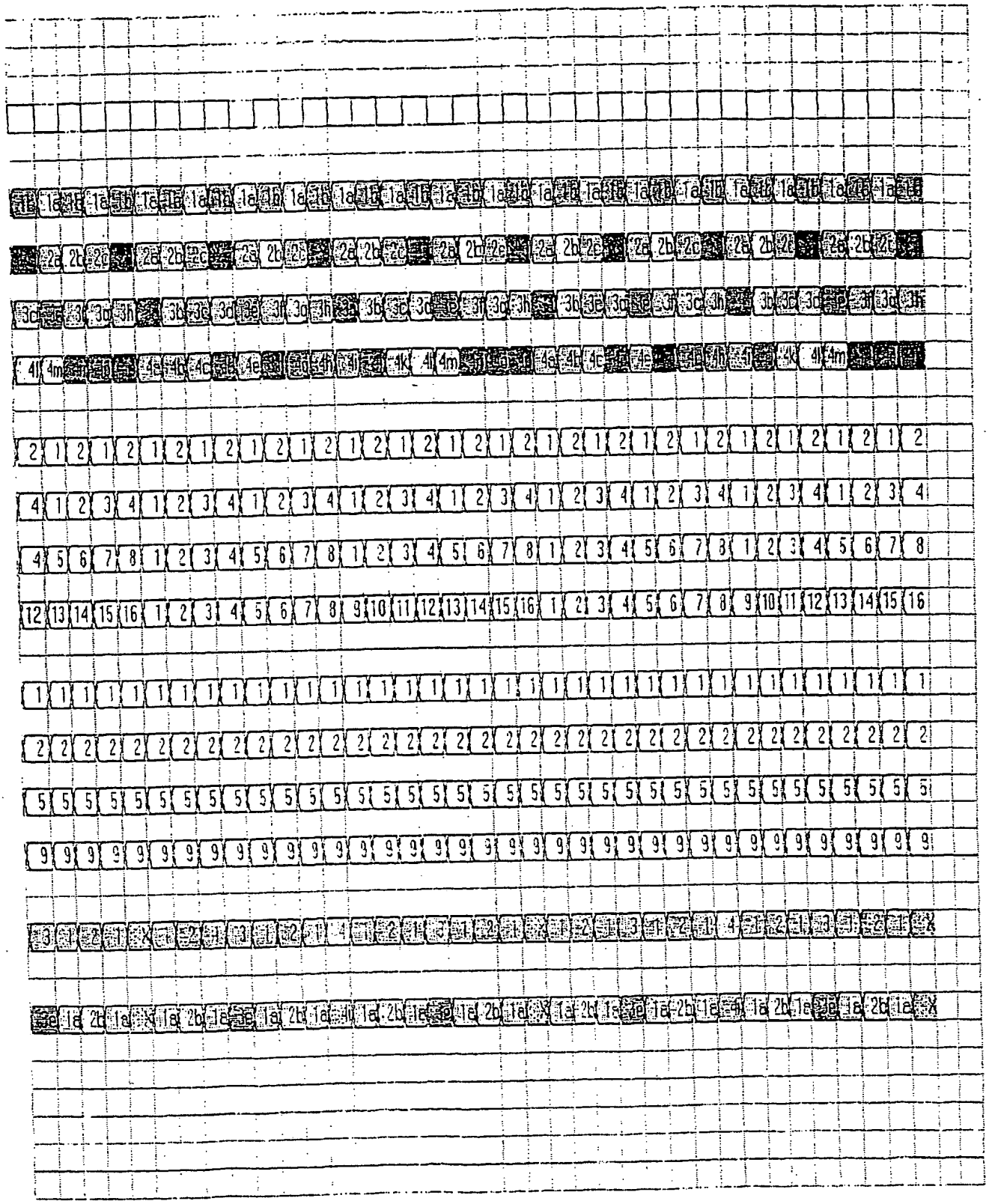


Fig. 16 - Part 2

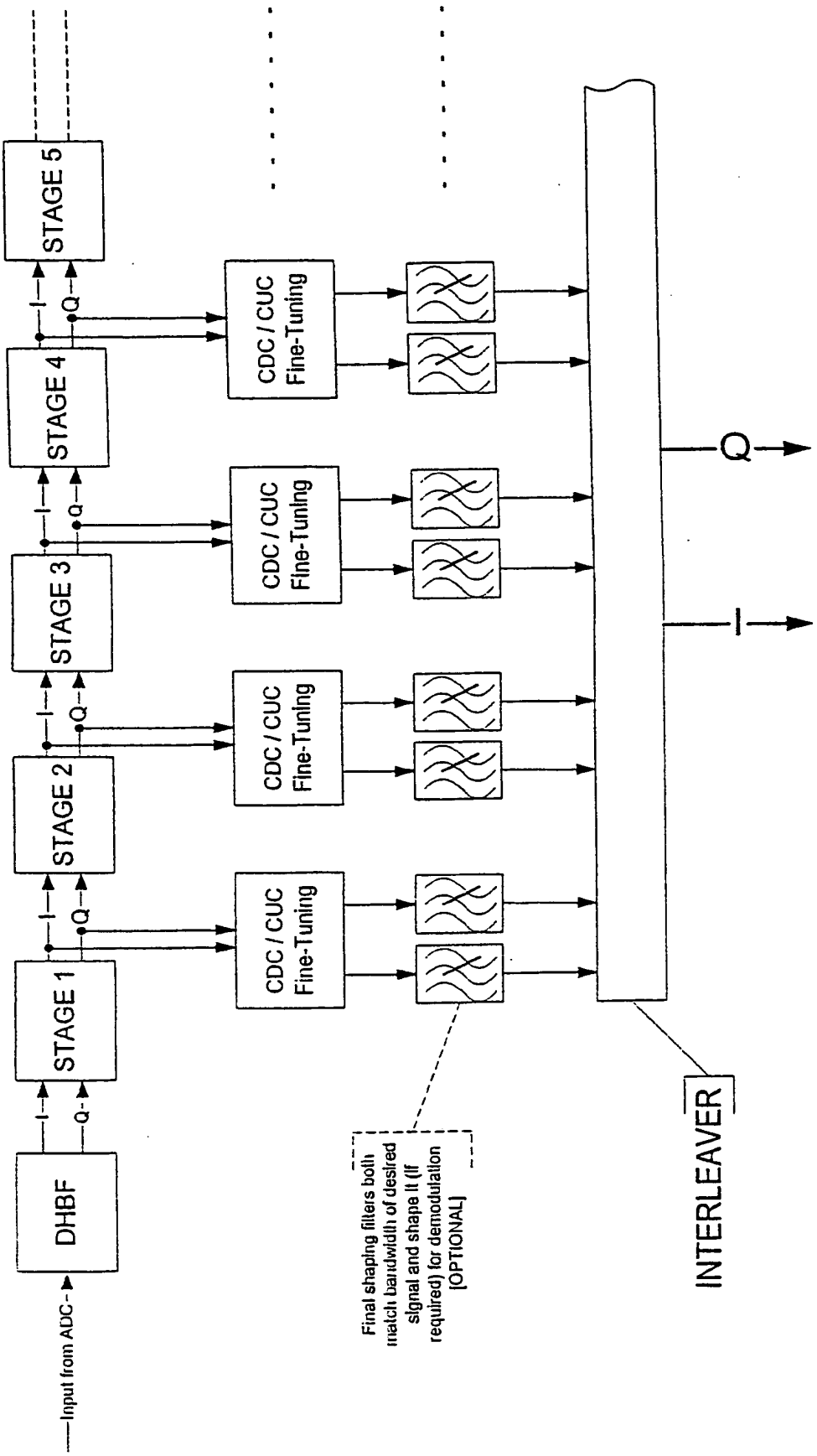

Input from ADC
DHBF
I
Q
STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5
CDC / CUC Fine-Tuning
CDC / CUC Fine-Tuning
CDC / CUC Fine-Tuning
CDC / CUC Fine-Tuning
Final shaping filters both match bandwidth of desired signal and shape it (if required) for demodulation [OPTIONAL]
INTERLEAVER
Q
I

FIGURE 17

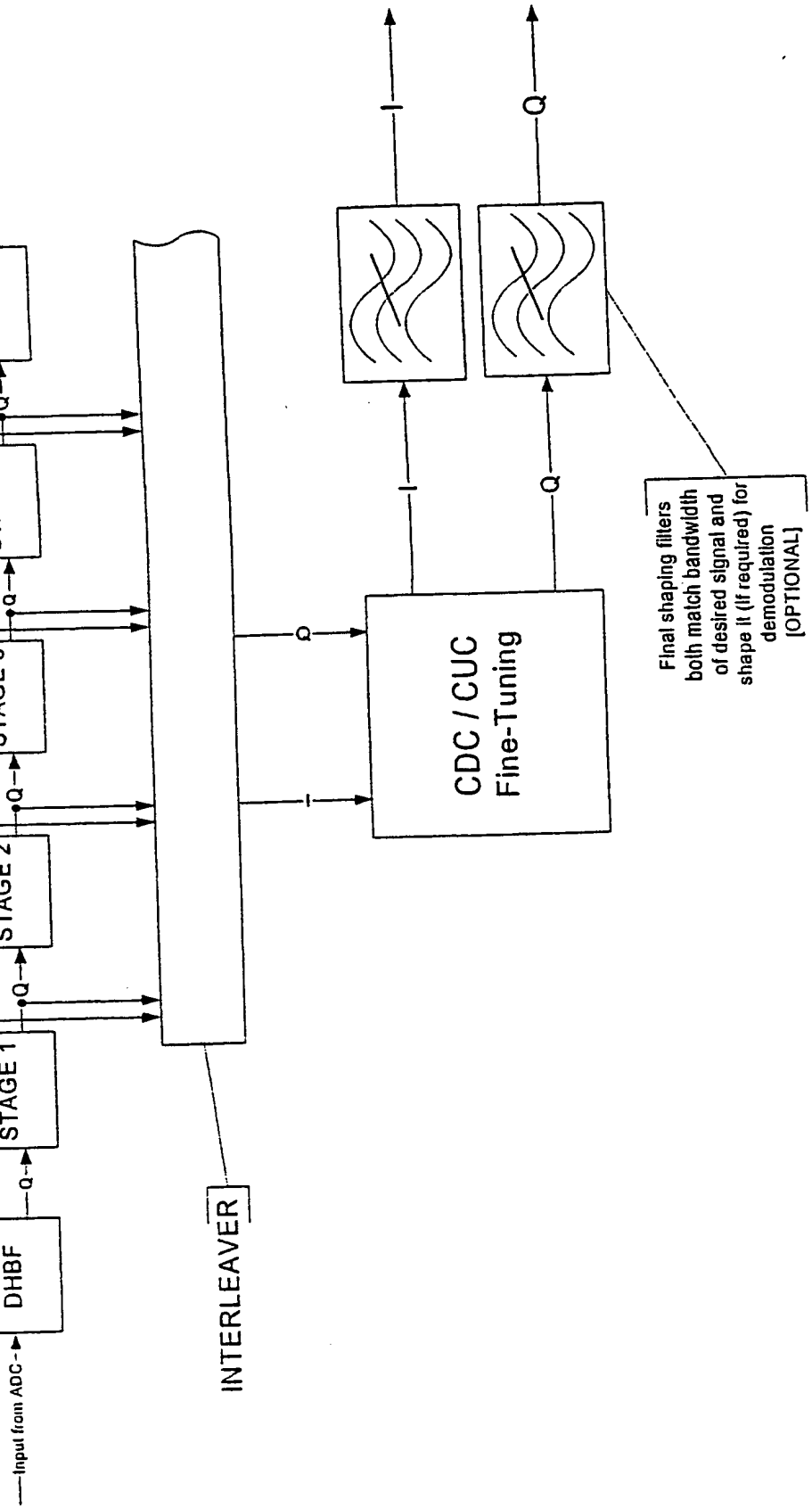

Input from ADC
DHBF
STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5
I
Q
INTERLEAVER
CDC / CUC
Fine-Tuning
Final shaping filters
both match bandwidth
of desired signal and
shape it (if required) for
demodulation
[OPTIONAL]

FIGURE 18

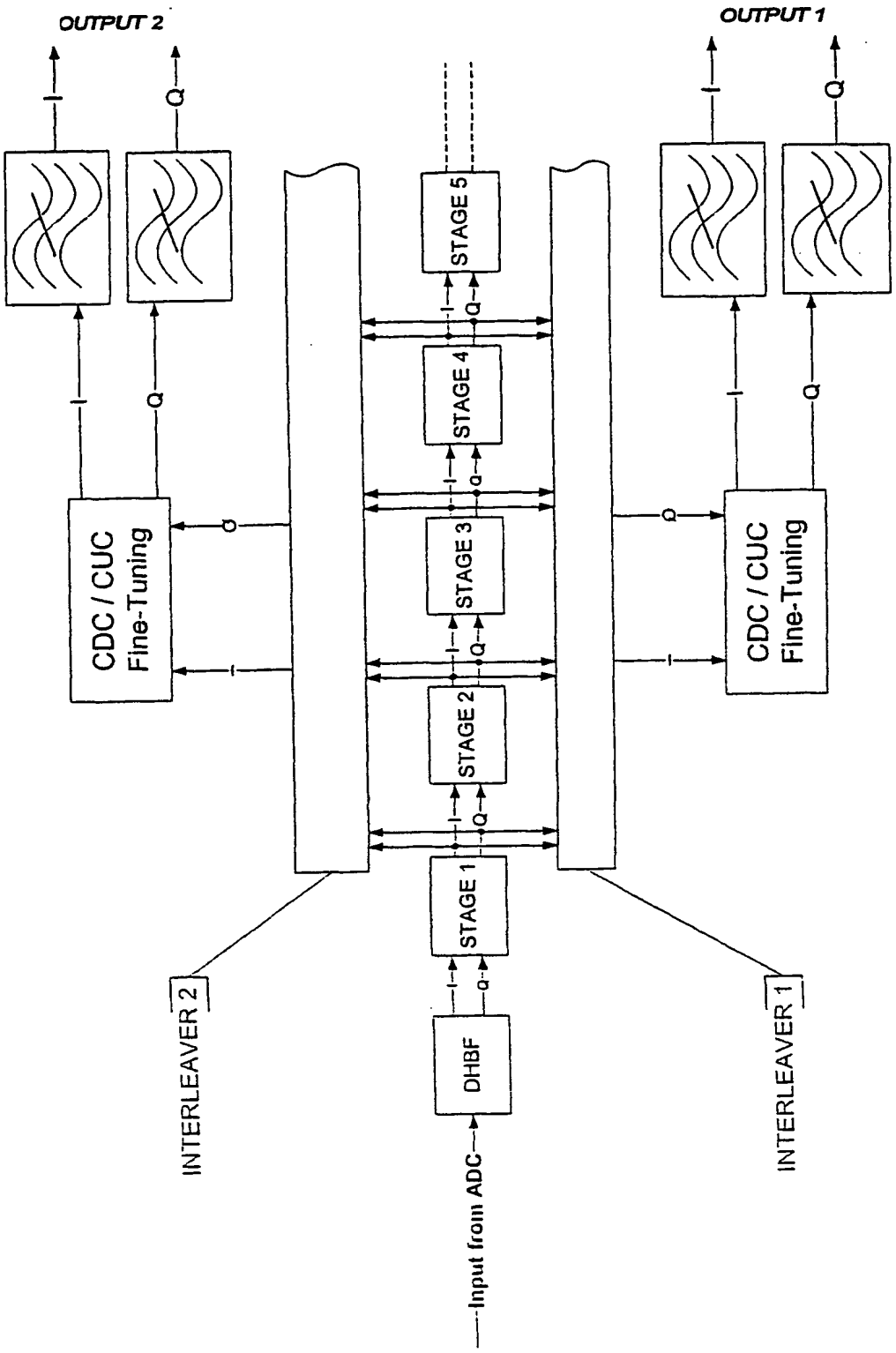

OUTPUT 2
OUTPUT 1
I
Q
STAGE 5
STAGE 4
STAGE 3
STAGE 2
STAGE 1
CDC / CUC Fine-Tuning
CDC / CUC Fine-Tuning
DHBF
INTERLEAVER 2
INTERLEAVER 1
Input from ADC

FIGURE 19

FIGURE 20

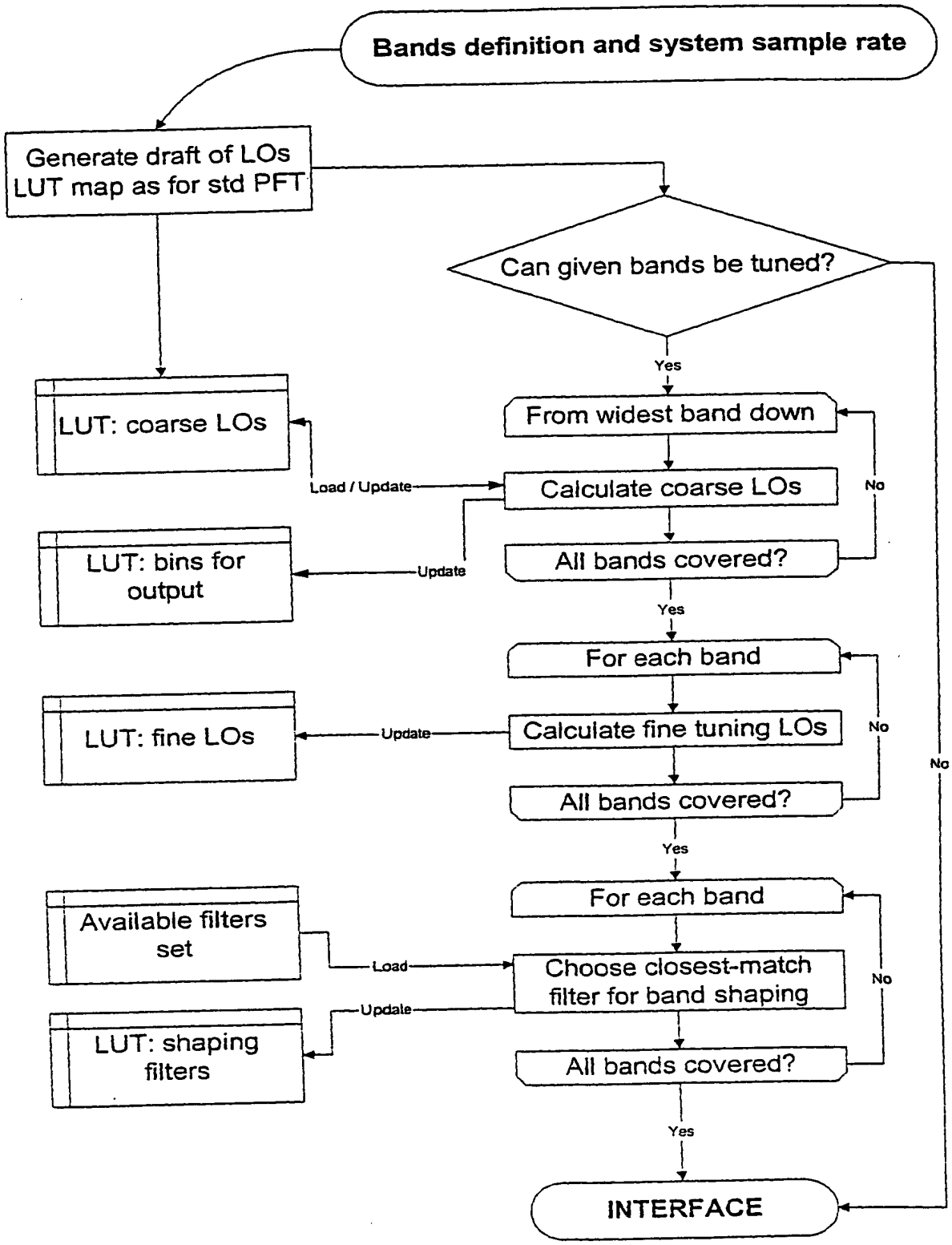

Bands definition and system sample rate
Generate draft of LOs LUT map as for std PFT
Can given bands be tuned?
Yes
No
LUT: coarse LOs
Load / Update
From widest band down
Calculate coarse LOs
No
LUT: bins for output
Update
All bands covered?
Yes
For each band
LUT: fine LOs
Update
Calculate fine tuning LOs
No
All bands covered?
Yes
For each band
Available filters set
Load
Choose closest-match filter for band shaping
No
Updale
LUT: shaping filters
All bands covered?
Yes
INTERFACE

FIGURE 21

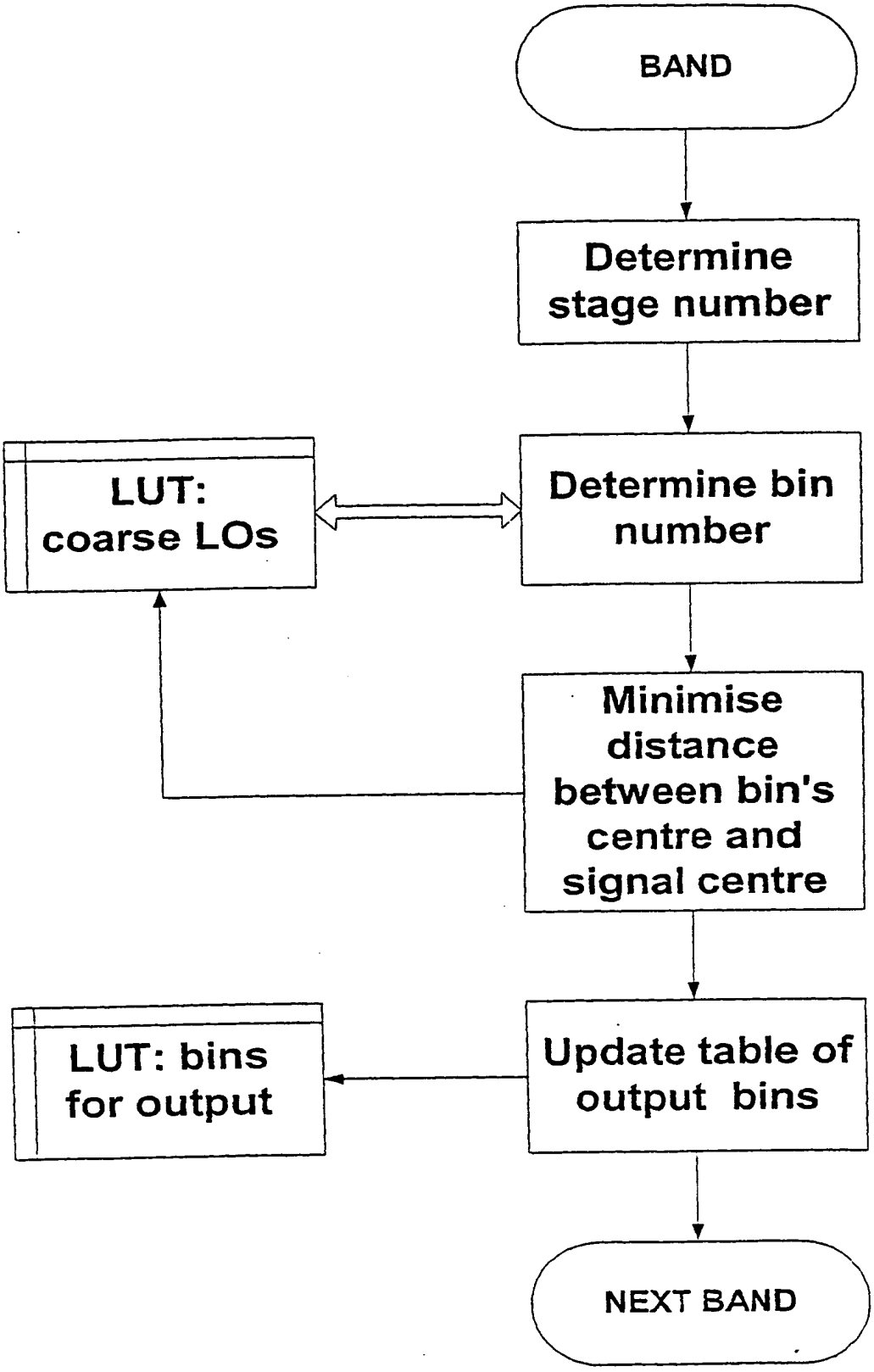

BAND
Determine stage number
LUT: coarse LOs
Determine bin number
Minimise distance between bin's centre and signal centre
LUT: bins for output
Update table of output bins
NEXT BAND

FIGURE 22

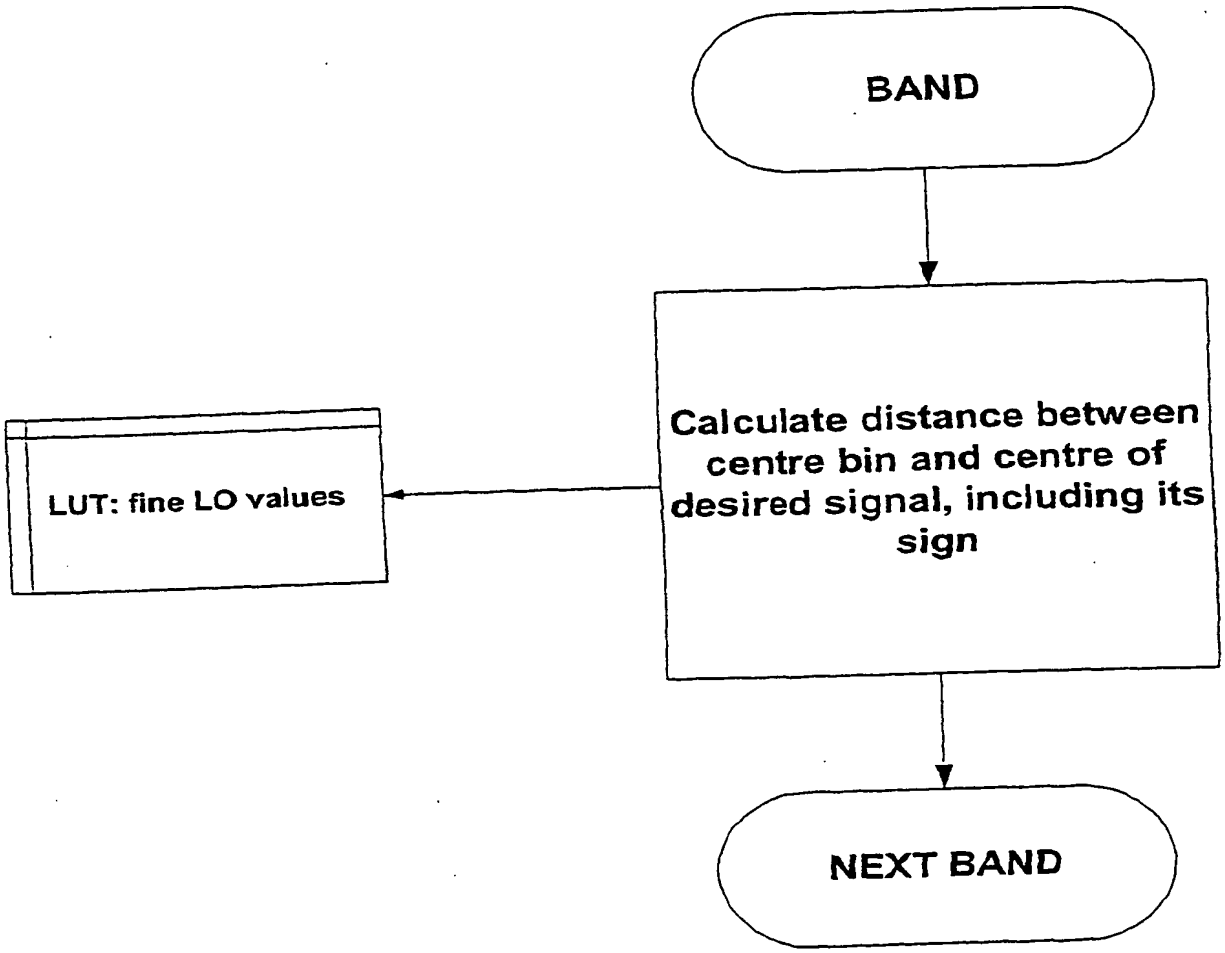
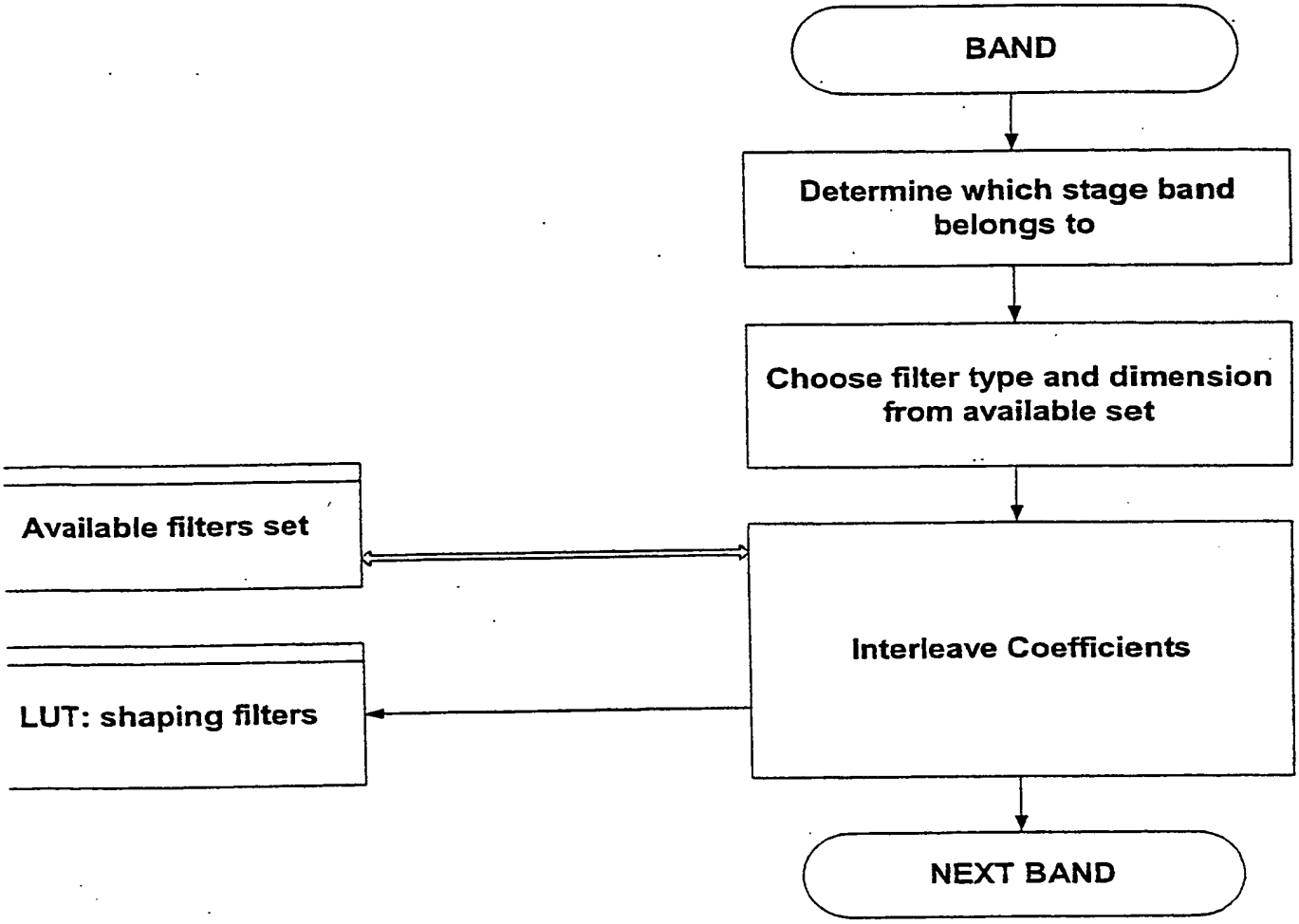

BAND
Calculate distance between centre bin and centre of desired signal, including its sign
LUT: fine LO values
NEXT BAND

FIGURE 23


BAND
Determine which stage band belongs to
Choose filter type and dimension from available set
Available filters set
Interleave Coefficients
LUT: shaping filters
NEXT BAND

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